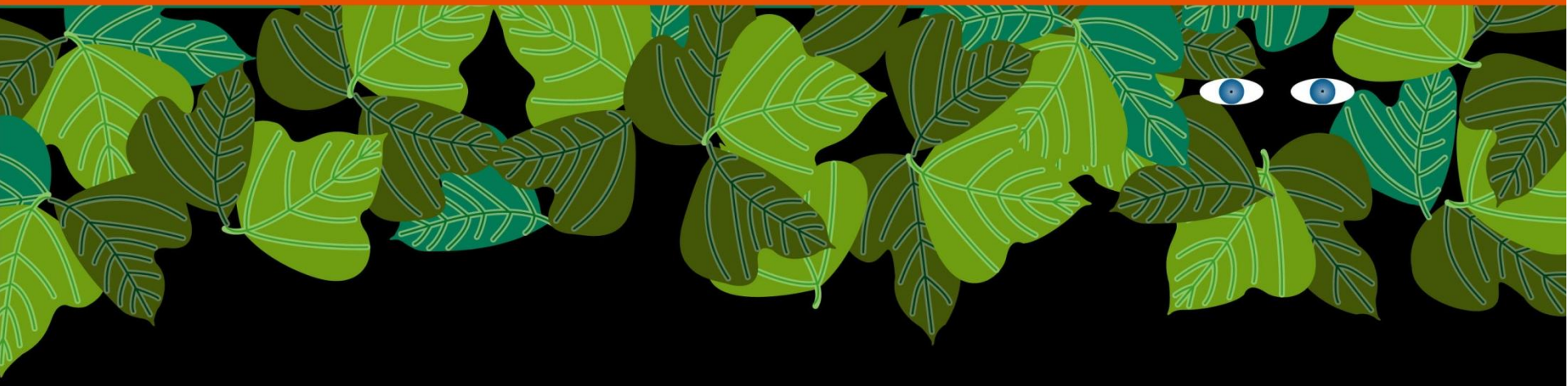


2010 DOI Conference on the Environment

Invasive Species and Climate Change: A Complex Picture

Lori C. Williams
National Invasive Species Council
Washington, DC

Invasive Species are:

- Not native to the ecosystem under consideration

- Whose introduction harms or is likely to harm to human health, the economy, or the environment

[Executive Order 13112]

Invasive Species include:

Plants, Animals and Microorganisms

Executive Order 13112

(Issued in February of 1999)

- Established the National Invasive Species Council (NISC)
  - The Secretaries of Agriculture, Commerce and the Interior co-chair NISC
  - Members include the Secretaries of State, Treasury, Defense, Homeland Security, Health and Human Services and Transportation, as well as the U.S. Trade Representative and Administrators of the Environmental Protection Agency, Agency for International Development and National Aeronautics and Space Administration
    - Executive Director & staff provided by the Department of Interior
- Established the Invasive Species Advisory Committee (ISAC) under FACA

National Invasive Species Council

Duties……..

1. Ensure that Federal activities concerning invasive species are coordinated, complementary, cost-efficient, and effective
2. Encourage planning & action at the local, tribal, State, regional & ecosystem levels
3. Recommend measures to enhance international cooperation
4. Facilitate development of a coordinated network for documenting, evaluating, and monitoring impacts from invasive species on the economy, environment, and human health
5. Draft and update a *National Invasive Species Management Plan* every two years.

The National Invasive Species Council

NISC Co-Chairs

- Secretary of Agriculture
- Secretary of Commerce
- Secretary of Interior

NISC Members

- Secretary of Defense
- Secretary of Health and Human Services
- Secretary of Homeland Security
- Secretary of State
- Secretary of Transportation
- Secretary of Treasury
- U.S. Trade Representative
- Admin. Of U.S. Environmental Protection Agency
- Admin. Of U.S. Agency for International Development
- Admin. of National Aeronautics and Space Administration

- USDA Policy Liaison
- DOC Policy Liaison
- DOI Policy Liaison

Each NISC Member has a Policy Liaison

NISC Staff

- NISC Executive Director
- Assistant Director Domestic
- Assistant Director International
- Program Staff (3 FTEs, 3 Details)

Invasive Species Advisory Committee (ISAC)

Invasive Species Advisory Committee (ISAC)

- Provide information and stakeholder input for consideration by NISC
  - Recommends plans and actions to achieve the goals of the Management Plan
- Represents a range of non-Federal expertise, constituencies, localities, and stakeholder interests
- Secretary of Interior provides administrative and financial support

Invasive Species and DOI

- Addressing Invasive species is an important part of meeting Secretarial Priorities:

  Youth – conducting invasive plant monitoring and removal

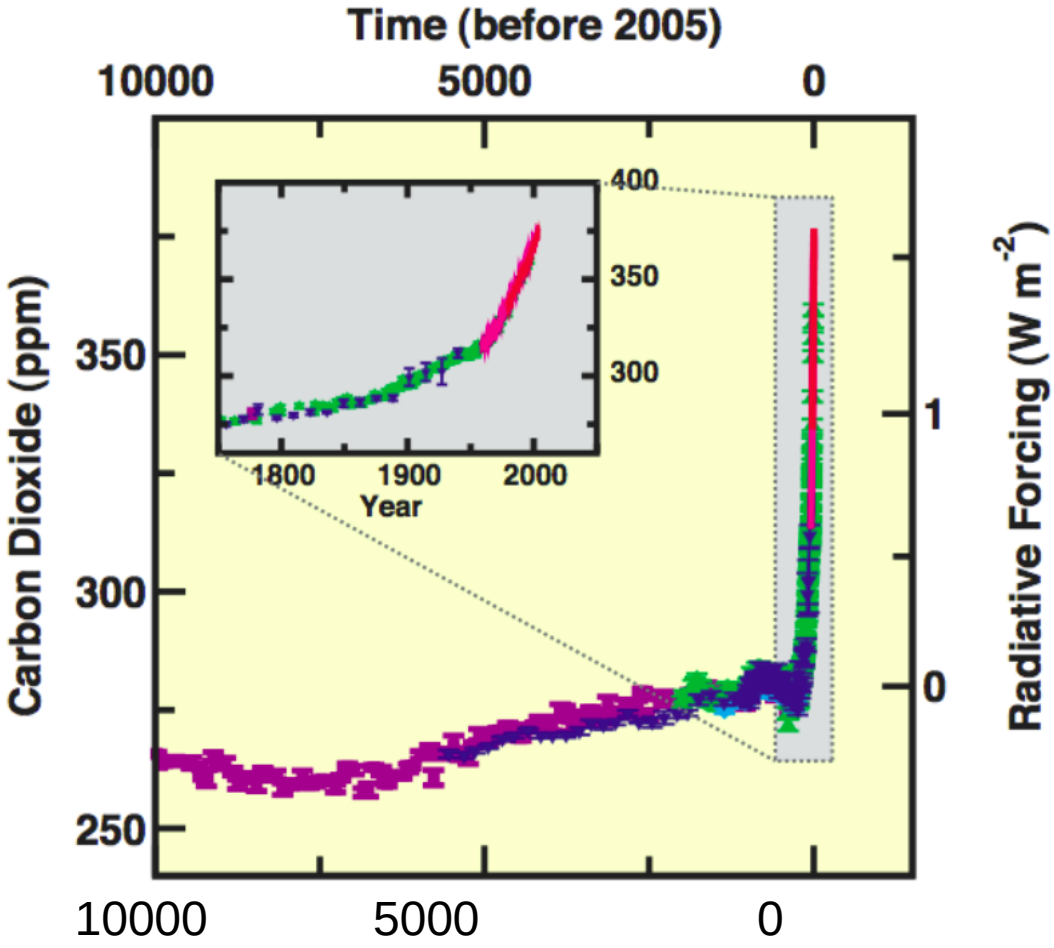
  New Energy Frontier – invasive plant biomass utilization

  Water Challenges – invasive species important aspect of California Bay-Delta MOU.

  Climate Change – impacts the range of invasive species and permanence of stored carbon

  Regulatory Initiatives – Secretarial call for banning large constrictor snakes.

More CO2 in the atmosphere



Jeffrey S. Dukes
Purdue University

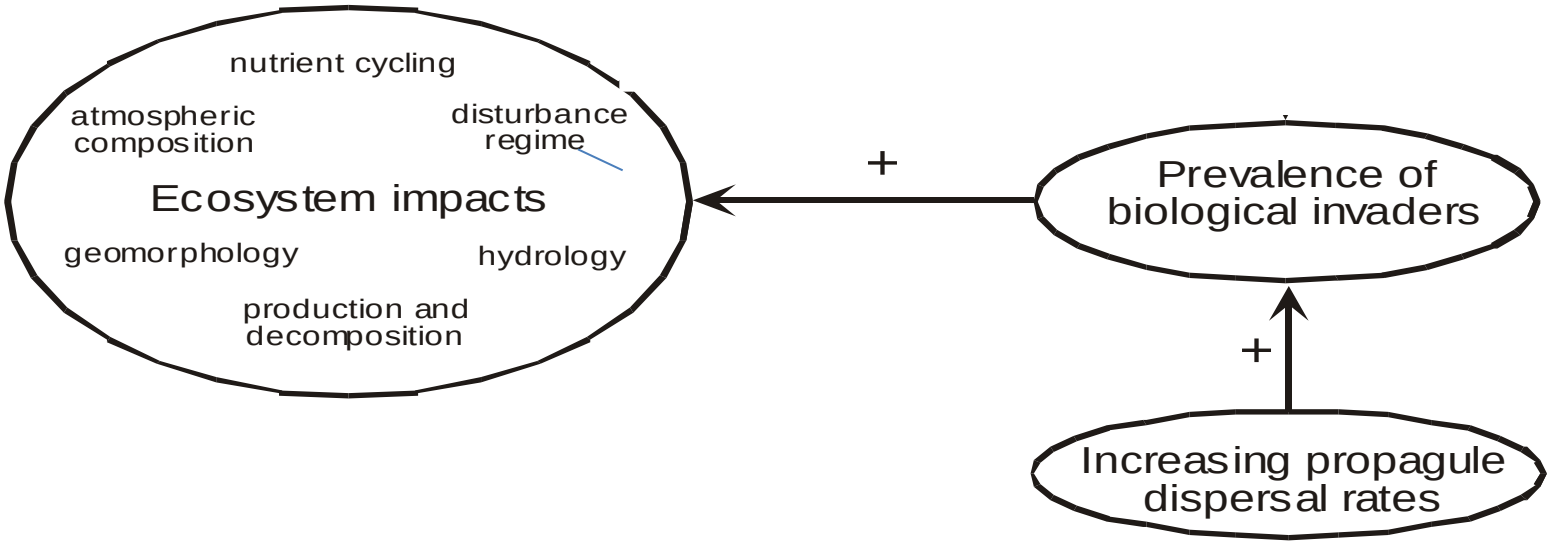
IPCC 2007

Basic Information about Environmental Changes

1. Burning fossil fuels adds CO_2 to the atmosphere.
2. Adding CO_2 to the atmosphere changes the climate.
   - Warmer and wetter in much of USA
3. Burning fossil fuels, using fertilizer adds nitrogen to many ecosystems

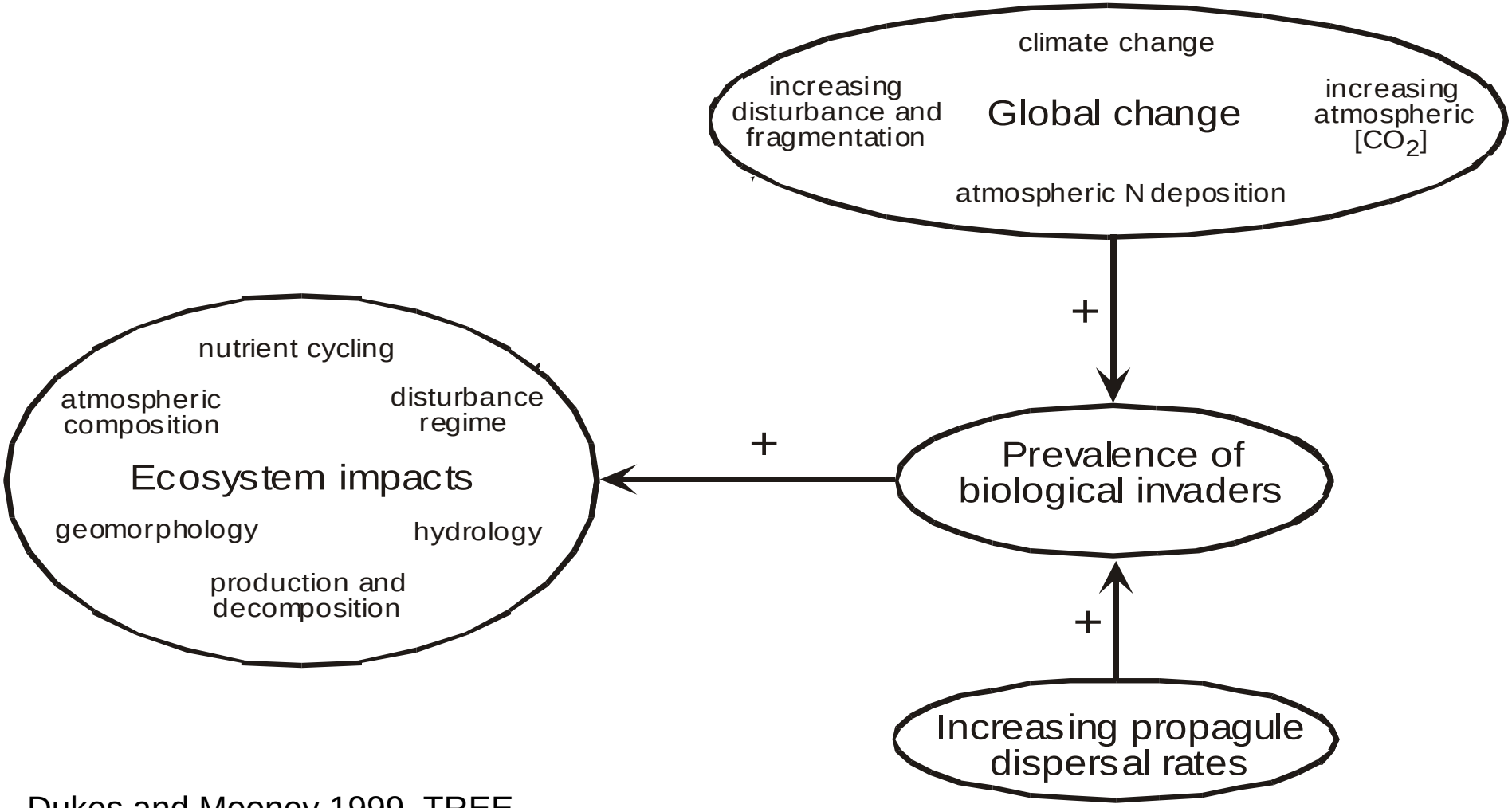
Jeffrey S. Dukes
Purdue University

Invasive species affect ecosystem-level properties and processes



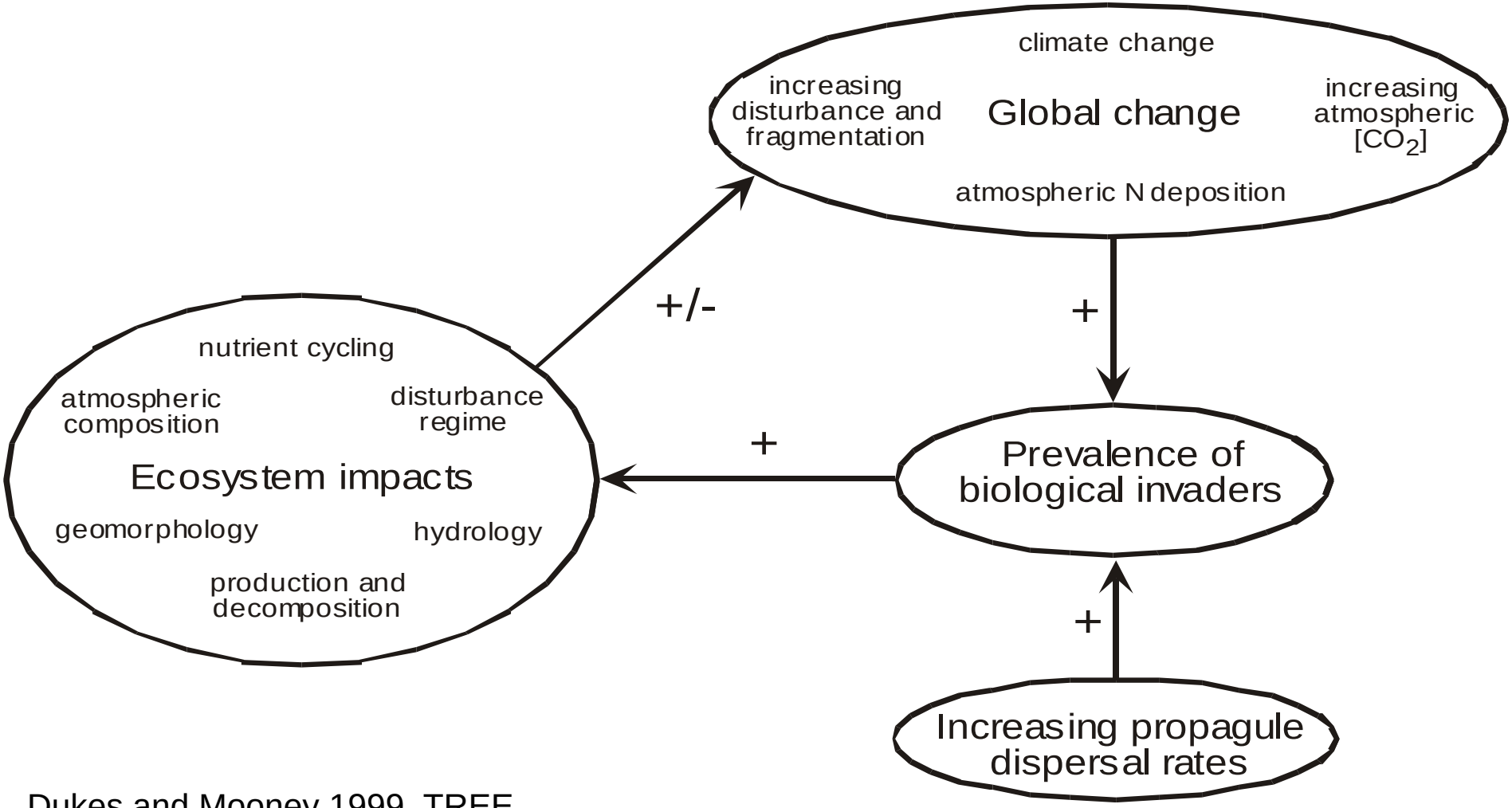
Dukes and Mooney 1999, TREE

Global changes may increase success of invasive species



Dukes and Mooney 1999, TREE

Invasive species may affect rates of some global changes



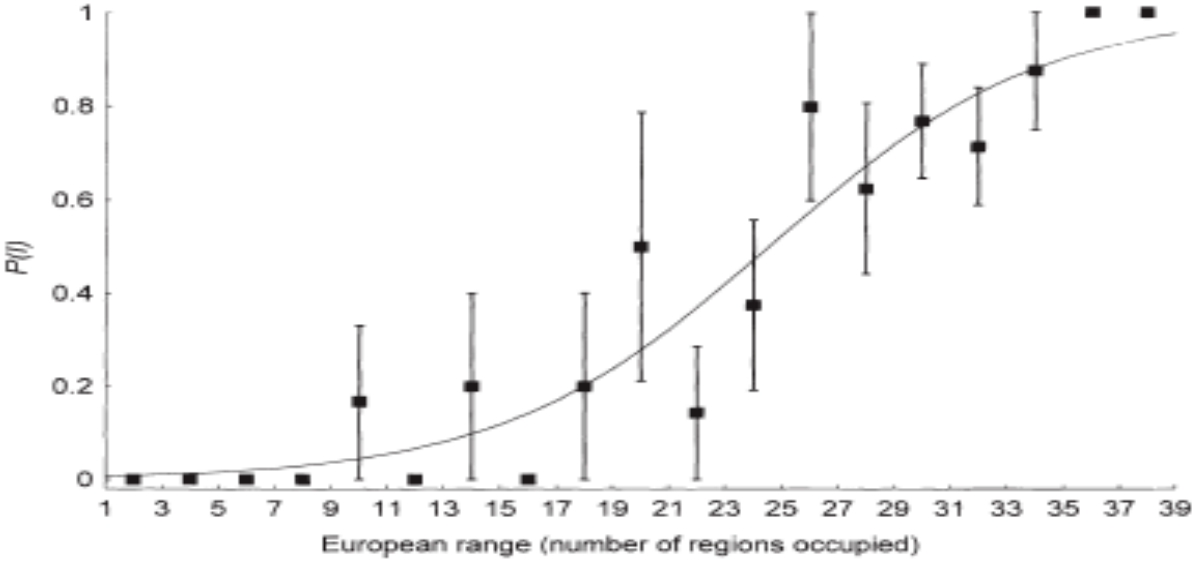
Dukes and Mooney 1999, TREE

Invasives are often more climate-tolerant than non-invasives

In some families, invasives span greater latitudes in native ranges (Rejmánek 1995)

Probability of plant species being invasive increases with breadth of native range

(Goodwin et al. 1999)



Jeffrey S. Dukes
Purdue University

Climate is changing…

1. Range shifts will occur
   - Some invasives might be expected to benefit as suitable area increases
   - Potential ranges of other invasives might contract

Jeffrey S. Dukes
Purdue University

INTERNATIONAL PERSPECTIVE

Food Security

- Agriculture and Plant Health
  - Inter-annual survival increasing with milder winters
  - Range changes of pests and other invasive species
  - Impacts on pesticide and herbicide effectiveness
  - IPPC – NAPPO, EPPO
  - FAO Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases
- Livestock and wildlife disease
  - Avian influenza, West Nile virus
  - Chytrid fungus (Bd)
  - Bluetongue, Rift Valley fever
  - OIE World Animal Health and Welfare Fund (2004)
- Fisheries management
  - Range expansion of invasive species (mitten crab, lionfish)
  - Impacts on reef fisheries
  - Impacts on wetlands and mangroves for fish spawning

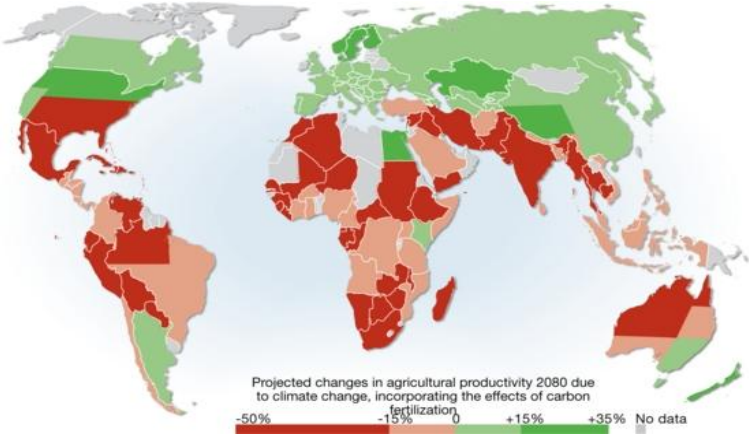
Stas Burgiel/Global Invasive Species Program (GISP)

Public Health

1. Emerging infectious diseases
   - Warming and shifting range of insect-borne disease
   - Waterborne disease and toxins from ocean warming
     - Avian influenza
     - Babesiosis
     - Cholera
     - Dengue Fever
     - Ebola
     - Lyme disease
     - Malaria
     - Plague
     - Rift valley fever
     - Sleeping sickness
     - Tuberculosis
     - Yellow fever
     - West Nile Virus
2. Border monitoring (e.g., airports) and internal responses
3. WHO – Global Outbreak Alert and Response Network

Trade & Livelihoods

1. Trade & Economic Livelihoods
   - Shifts in production and trade of commodities
   - Pathways
     - ❑ Changes in volume and origin/destination
     - ❑ Changes in viability of survival
   - WTO and Standards and Trade Development Facility
2. Trade routes
3. Transportation
   - Aviation (ICAO)
   - Shipping (IMO)

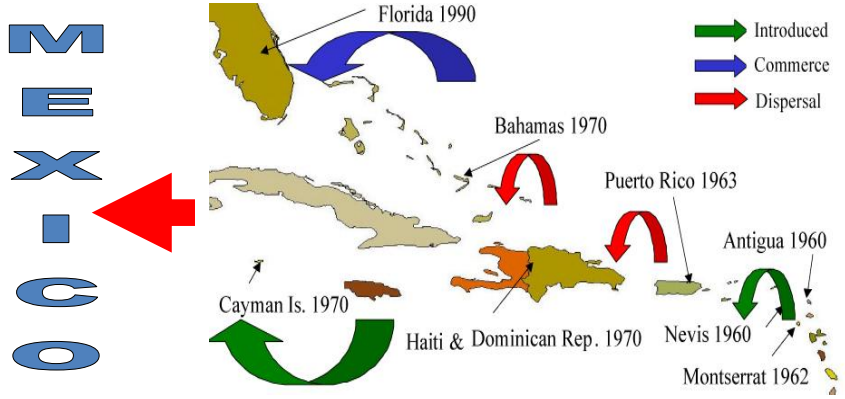


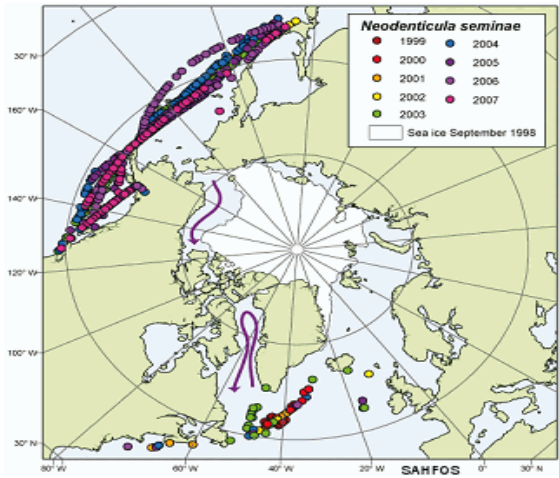
Stas Burgiel/**Global Invasive Species Program (GISP)**

Biodiversity Conservation

Policy & Definitional Questions

1. Human assisted migrations
   - Corridor development for wildlife preservation
   - Assisted colonization
2. Climate assisted migrations (???)
   - Movement of cactus moth (Cactoblastis cactorum) to Mexico (2006)
   - Migration of African desert locusts (Schistocerca gregaria) to the Caribbean (1980s)
   - Migration of Pacific diatom (Neodenticula seminae) into North Atlancic (1999)
3. Definitional issue of alien vs. native





Stas Burgiel/**Global Invasive Species Program (GISP)**

Moving Forward…

1. Risk and pathways assessments
   - Evaluate species and pathways across changing climate window and biogeography
   - Predictive models especially for outbreaks and spread (pests, diseases)

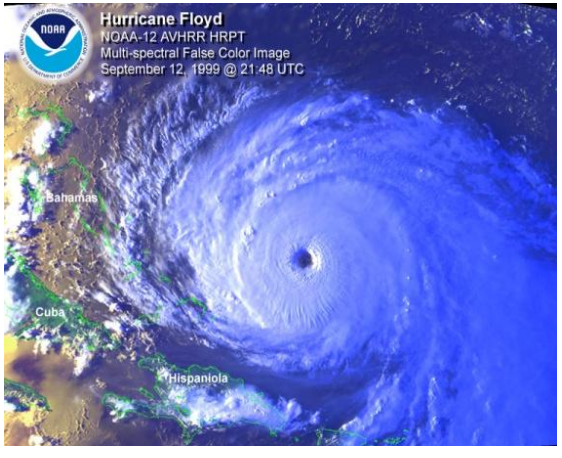
2. Early detection, warning and rapid response (monitoring)
   - Integrate invasive species and climate change into existing monitoring
   - Develop response plans and identify/secure resources
   - Integrate invasive species considerations into climate change preparedness activities and plans
   - Examine applicability of food security and human health models (OIE, FAO, WHO)

Stas Burgiel/**Global Invasive Species Program (GISP)**

Moving Forward…

- Regional focus and focus on islands
- Islands often most advanced and aware on invasive species issues
- Islands frontline of climate change impacts (sea level rise, extreme weather events)

Training in the field on Viwa Island, Fiji. © Karen Johns



Stas Burgiel/**Global Invasive Species Program (GISP)**

Carbon Sequestration

EISA U.S. Public Law 110 -140 (Energy Independence and Security Act of 2007) "biological carbon sequestration mitigates climate change, restores ecosystem health, and creates green jobs."

However, little attention has been given to impact of biological invasions on carbon storage (D. A. Peltzer et al. 2010, Global Change Biology. 16, pages732–746).

Stopping invasive insects and plant pathogens protects forests and the permanence of stored carbon.

Currently a number of potentially invasive plants and algae are being considered for use in the production of biofuel.

EISA mandates the production of 61 billion liters of plant cellulosic-based fuels. This cannot be met with current agricultural, forestry, and municipal residues.

EISA Necessitates promoting biofuel crops for experimentation and large-scale planting.

Most crops non-native species - few are invasive.

However, the few that are invasive have caused substantial socio-economic and environmental damage (e.g., johnsongrass *and kudzu).*

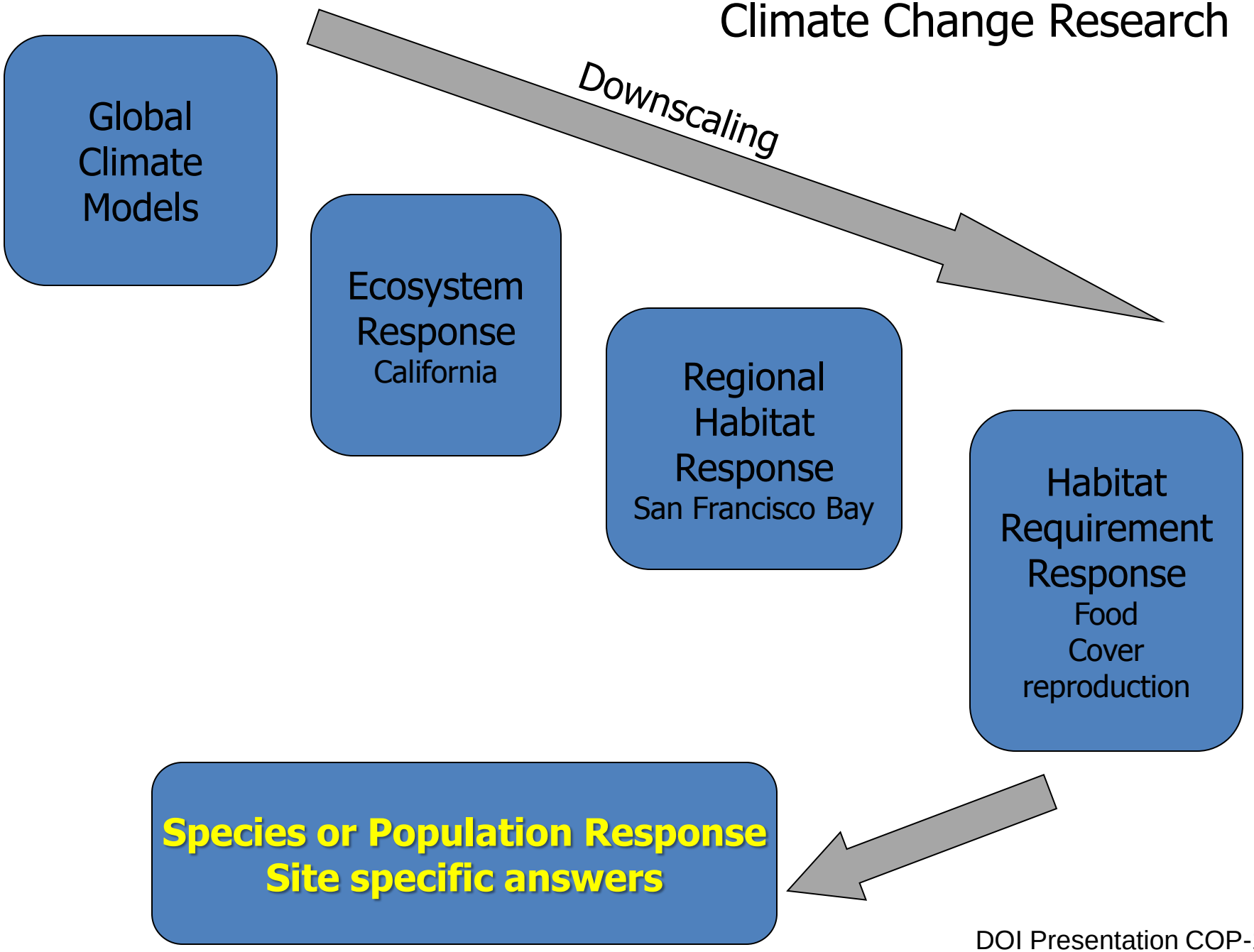
Climate Change, Invasive Species & Land Use Change

Secretarial Order on Climate Change

- S.O. 3289 establishes the **Climate Change Response Council**- within office of the Secretary- to execute a coordinated Department-wide strategy to increase scientific understanding and development of adaptive management tools to address the impact of climate change.

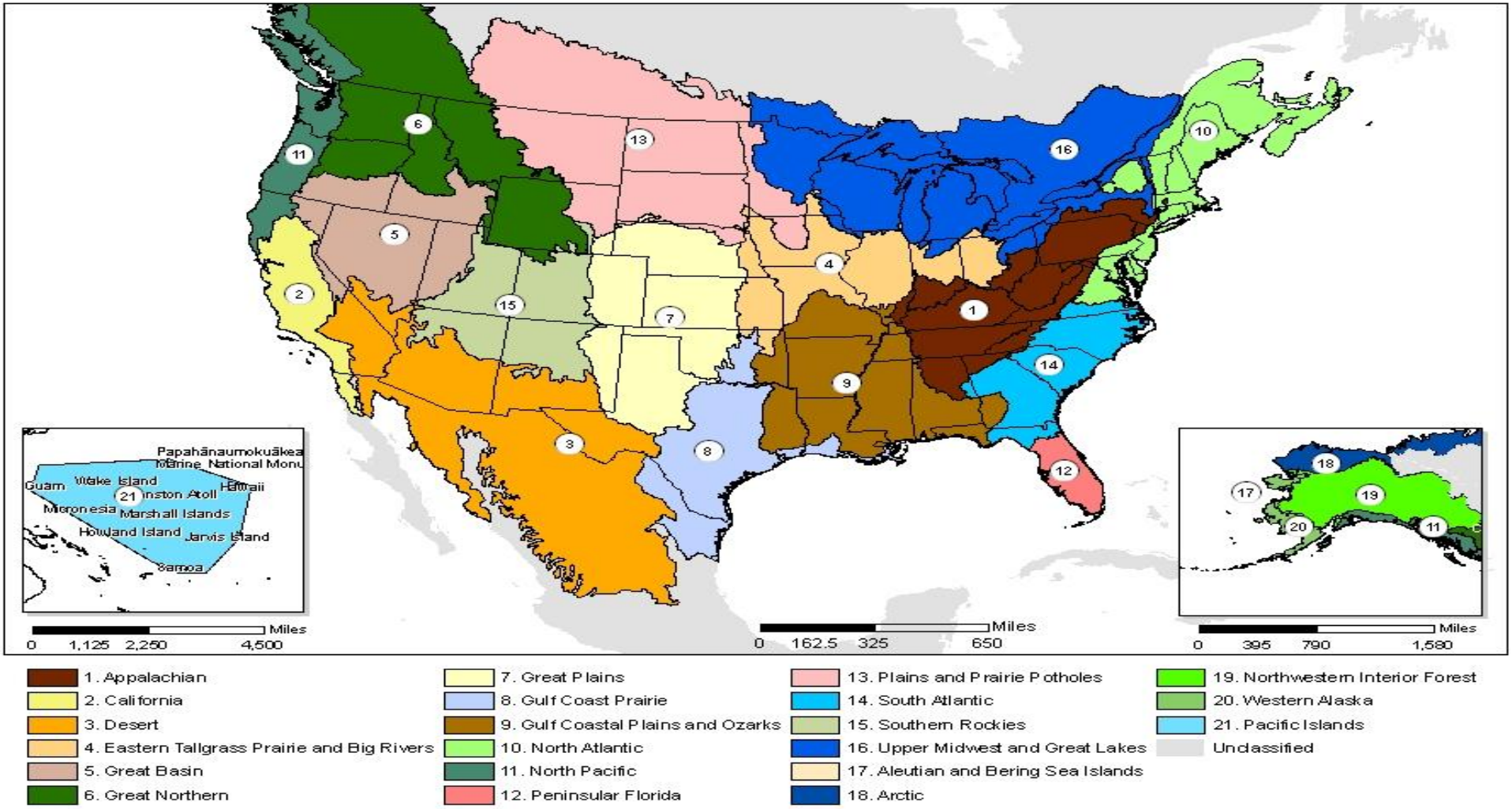
- The Climate Council is implementing DOI climate change activities through:
  1. Climate Change Response Planning Requirements
  2. DOI Regional Climate Change Response Centers
  3. Landscape Conservation Cooperatives

Climate Change Research



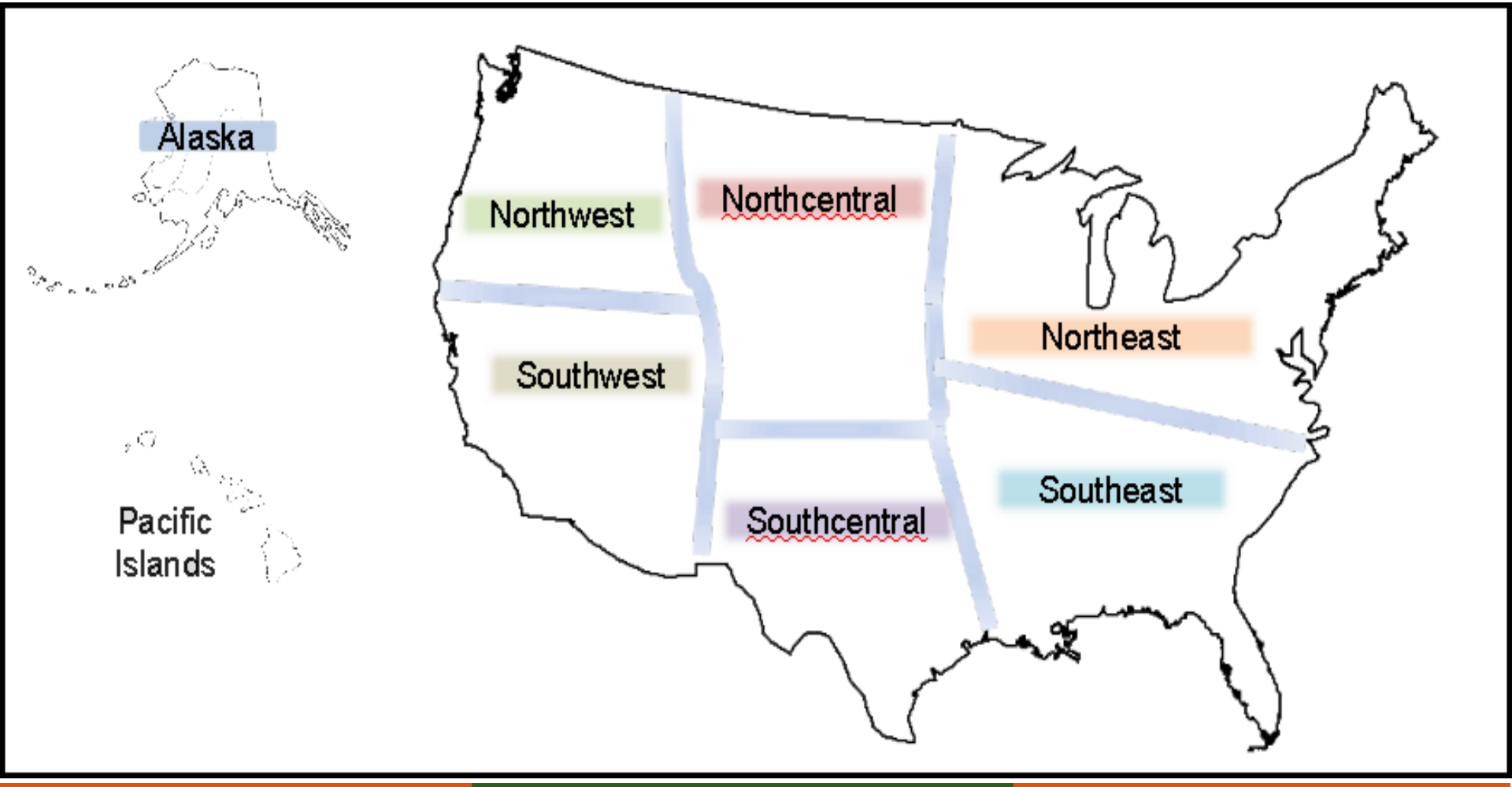
Landscape Conservation Cooperative

Secretarial Order No. 3289 establishes Landscape Conservation Cooperatives, which focus on on-the-ground strategic conservation efforts at the landscape level.



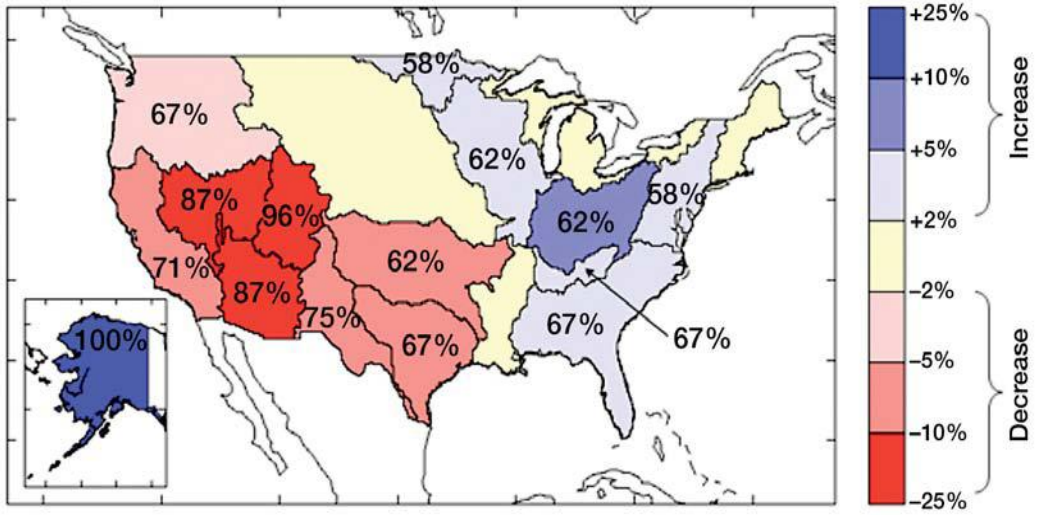
DOI Website

Climate Science Centers



Varying Water Availability Under a Changing Climate
BOR and USGS Collaboration

Challenge: Climate change may reduce long-term sustainability of water supply in the southwestern US.



The Science:

- Climate warming is expected to decrease snowpack and reduce spring/summer snowmelt in the West.
- Water supply shortages may decrease between 6% and 45%. Water managers need help on deciding which predictions they should use as a basis for water-supply planning.

Solution: BOR Research and Development Office, NOAA, USACE, USGS, EPA, USDA, and other stakeholders are working together to develop and provide a Climate Change Integration Technical Training Program for western water practitioners, planners, technical specialists and/or decision-makers.

Invasive Species & Fire: USGS Science and BLM Solutions: Great Basin Restoration Initiative

Challenge: Restoring native plant communities, reducing fire frequency, and "pre-adapting" for climate change – planting communities in anticipation of local changes due to a changing climate.

The Science: Invasive annual grasses (e.g. cheatgrass) are increasing rapidly throughout the western U.S. These fire-tolerant species increase fire frequency, eliminating native plants, wildlife habitat and livestock forage. USGS is:

- Mapping annual plant invasions
- Developing native plant restoration protocols
- Mapping historic fires to understand causes

Solutions:

- The BLM and its partners are conducting a natural habitat restoration effort for millions of acres in the Great Basin of Nevada, Oregon, Idaho, California, and Utah.

- The BLM and partners are working with commercial seed producers to grow native seed for restoration.

Recommendations

1. Better prediction (improve models by incorporating more information)
2. Better collaboration among neighbors
3. Better early detection network
4. Better mapping (helps all above points)
5. Better database integration
6. Most of this is already on the radar

Jeffrey S. Dukes
Purdue University